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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/900,710 | 07/06/2001 | Yezdi N. Dordi | 003698 P1 | 3961 |
| 32588 | 7590 | 12/23/2003 | EXAMINER | |
| APPLIED MATERIALS, INC. 2881 SCOTT BLVD. M/S 2061 SANTA CLARA, CA 95050 | | | PHASGE, ARUN S | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1753 | |

DATE MAILED: 12/23/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/900,710

Applicant(s)

DORDI ET AL.

Examiner

Arun S. Phasge

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-35 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-35 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
- a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) ____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Specification

The Specification is replete with references to U.S. Patent Applications. Applicants should update the status of the applications as far as possible, i.e., pending, abandoned or patented with the patent number.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-5, 9, 11, 12, 15, 18, 20, 22, 29-30 are rejected under 35 U.S.C. 102(b) as being anticipated by Kosaki, U.K Patent Application GB 2,285,174A.

The Kosaki patent discloses the claimed method of processing a substrate having a feature comprising depositing a barrier or insulating layer, depositing a first conductive layer, such as a Ni layer by pvd, depositing a second conductive layer, such as the doped Ni layer by electroless plating and depositing a third

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conductive layer on the second conductive layer by an electroplating process which would at least partially fill the feature (see pages 11-18).

Consequently, since the Kosaki patent discloses each and every limitation, the claims are anticipated.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-3 and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Robinson et al. (Robinson), U.S. Patent 6,326,303 B1.

Robinson discloses the claimed method of processing a substrate comprising, depositing a barrier layer on a substrate, such as TiN by pvd, the depositing a first conductive material on the barrier layer, such as Al by pvd, and depositing a second conductive material on the first conductive material by an electroless deposition process to fill discontinuities formed in the first conductive material (see columns 11-12). The reference further discloses the method of rinsing the substrate after the electroless deposition (see col. 13, lines 15-18).

Therefore, since the Robinson patent discloses each and every limitation, the claims are anticipated.

Claim Rejections - 35 USC § 103

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-9, 11, 13-20, 23-26, 29-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen, U.S. Patent 6,197,181 B1 in view of Gilton et al.

(Gilton), U.S. Patent 6,489,235 B2 and Palmans et al. (Palmans), U.S. Patent 6,585,811 B2.

Chen discloses the claimed method of processing a substrate, comprising depositing a barrier layer on a substrate by pvd, depositing a first conductive material on the barrier layer by pvd, depositing a second conductive layer to fill discontinuities formed in the first conductive material and depositing a third conductive material on the second material by another electroplating process (see columns 3-6). The reference further discloses the same types of metals used to form the many layers (see col. 13-20).

The reference does not disclose that the second conductive layer occurs by electroless, rather the second conductive layer is provided by electrochemical deposition. The Chen reference also does not disclose the step of rinsing after electroless. The reference further fails to anneal after the electroplated layer is deposited.

The Gilton patent is cited to show the functional equivalence between the electroless and electrochemical deposition (see col. 5, lines 40-42). The Gilton patent further discloses layers of substrate, barrier layer by the same types of techniques claimed, followed by electroless deposition and continued by

electrolytic deposition (see col. 4, line 15 to col. 5, lines 35). The reference further discloses the same types of metals plated (see claim 20). The Gilton patent further teaches the use of annealing after electroplating (see col. 2, lines 46-50).

The Palmans patent is cited to show a substrate, a barrier layer plated by a similar technique, followed by electroless deposition and electrolytic deposition (see col. 7, line 25 to col. 8, line 45). The reference further discloses the use of rinsing between depositions as required by the prior art (see col. 7, lines 1-3).

Consequently, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the disclosure of the Chen patent in view of the Gilton and Palmans, because the secondary references disclose conventional techniques used in the art of processing substrates and the Gilton patent further teaches the functional equivalence between the electroless and electrolytic depositing techniques.

Claims 10, 12, 21, 22, 27, 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen in view of Gilton and Palmans as applied to claims above, and further in view of Kosaki.

None of the references disclose the use of doping or impurities for layers as claimed. The Kosaki patent is cited to show the use of dopants to form alloys, such as P, B and/or W with the metal of choice, such as Ni (see page 17).

Therefore, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the disclosure of the prior art, because the Kosaki patent teaches that such use of the dopants allows the deposited layer to "adhere closely to the inner surface of the hole."

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arun S. Phasge whose telephone number is (703) 308-2528. The examiner can normally be reached on MONDAY-THURSDAY, 7:30-6:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X Nguyen can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

Arun S. Phasge
Primary Examiner
Art Unit 1753

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